



Introduction

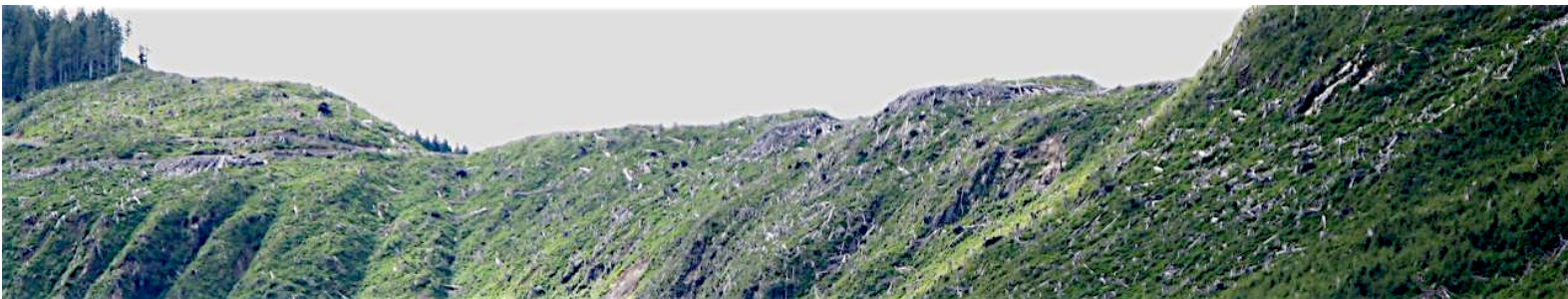
The Tongass Futures Roundtable (TFR), a collaborative effort of stakeholders addressing public policy issues on the Tongass National Forest and Southeast Alaska, is now considering the use of sawmill waste and small diameter cordwood (referred to as woody biomass) from Southeast Alaska's forests as a potential source of biofuels.

This proposal purports to address three concerns facing the region: the need to fund forest restoration, increasing energy costs and the need to reduce dependence on fossil fuels. First, there are enormous costs associated with maintaining nearly a million acres of clearcuts in Southeast Alaska. There is a substantial backlog of commercial thinning and forest restoration overdue on state, federal and native corporate timberlands. The second concern stems from the economic hardships created by the recent spike in the cost of petroleum fuel products used for heating and generation of electricity in rural communities of Southeast Alaska. Finally, climate change mitigation requires a national effort to reduce dependency on fossil fuel by switching to renewable energy resources.

Now that the economic stimulus bill has been signed, a rapid distribution of funds is in the offing. Some on the TFR perceive the economic stimulus plan as an opportunity to seek subsidies for the timber industry to fund commercial thinning (rebranded as "stewardship", and "restoration"), and, it is claimed, measures to restore ecosystem integrity. The proponents hope to use much of the resulting woody biomass, along with sawmill waste, to heat municipal and other public buildings. The stimulus bill would also fund the associated infrastructure costs, including large scale road construction.

Overview -- The Proposal Before the Roundtable

The present TFR proposal is the first large scale plan to employ woody biomass energy systems in Southeast Alaska, but the concept is well underway across the United States. An extensive national biofuel program is being developed, purportedly, to address national security, economic, and climate change concerns. Three quarters of greenhouse gas emissions (primarily CO₂) result from fossil fuel combustion. Deforestation and agricultural practices dominate the remaining greenhouse gas emissions.



Forests play a vital role in absorbing CO₂ from the atmosphere and storing carbon. Over half of the stored carbon litters the forest floor as fine and coarse woody debris (CWD) and is stored in the soil. CWD also provides habitat for animals of all sizes, both vertebrate and invertebrate. Biomass is to biofuel as CWD is to healthy forest ecosystems.

The TFR proponents of biomass removal justify it as habitat restoration, but this reasoning is fundamentally flawed. Eventual planned timber harvest of the second growth, ultimately, results in restoring clearcuts -- not habitat. Commercial thinning represents, at best, only temporary improvement due to ensuing canopy closure within 20 years. Centuries are required to restore oldgrowth structure and function in the aftermath of clearcutting old-growth habitat.

Past failures to maintain well distributed and viable populations of oldgrowth dependent species can be directly attributed to either ignoring scientists' warnings of foreseeable consequences or proceeding with large scale management activities in the absence of a complete scientific understanding of the consequences. Examples of threatened species from other regions include the spotted owl, marbled murrelet, and red cockaded woodpecker. Such is the case with present discussions at the TFR around woody biomass energy systems dependent upon the removal of massive quantities of organic material, *labeled as waste*, from the forest.

While very little science has been applied to the long term effects of large scale biomass removal from the second growth stands of Southeast Alaska, there is a rich body of science to draw from where biomass removal has already occurred elsewhere in the United States. Scientists working at the Division of Agriculture's Forest Resources Center at the University of Arkansas presented to the Ecological Society of America (March 2008) "Conference on the Ecological Dimensions of Biofuels" stating their findings and concerns:

Woody debris in a forest is important to populations of vertebrates (Harmon, et al. 1986, Freedman et al. 1996) as well as invertebrates (Caldwell, 1996) and insects (Hanula 1996). Removal of logging slash can negatively impact small mammals, birds, (Butts and McComb 2000), and influence invertebrate (Caldwell, R.S. 1996) and insect (Hanula 1996) community composition and structure.

Coarse woody debris is an important indicator of species abundance (Carey and Johnson 1995). McCay and Komoroski (2004) found that removal of woody debris lowered shrew populations, Carey and Johnson (1995) found that levels of coarse woody debris of less than 15-20% were not adequate to maintain small mammal populations. The total quantity, size, and distribution and decay status of woody debris in a forest are important in determining habitat quality (Miller and Getz 1977 and Maser and Trappe 1984).

Holly K. Gibbs (University of Wisconsin-Madison) offered this insight in her presentation at the Ecological Society of America's Conference on the Ecological Dimensions of Biofuels:

"... biofuel crop expansion into carbon-rich forests may lead to carbon deficits lasting several decades to millennia because the loss of carbon from deforestation far exceeds carbon savings from biofuel substitution of fossil fuels."



Overlooked -- Southeast's *Non-Combustion* Renewable Resources

Southeast Alaska possesses vast reserves of underutilized renewable energy capacities which don't threaten the array of ecosystem services provided by intact watersheds. Such renewable energy alternatives don't incur widespread fish and wildlife habitat degradation, nor do they release massive quantities of CO₂, nor do they contribute to ocean acidification and climate change accelerating black carbon emissions.

These options include:

- **Hydropower** Southeast Alaska on average, receives between 150 to 560 cm. of precipitation a year allowing for countless sources for small, medium and large hydropower sites often adjacent to towns.
- **Tidal power and Wave energy** Many areas of Southeast have 20 foot tidal exchanges occurring in 6 hours while new technology can generate electricity even in slower saltwater or freshwater currents.
- **Geothermal** Alaska has more geothermal resources than any other state in the country. There are at least 19 known potential sites (and likely many more) in Southeast.
- **Wind energy** According to the Dept. of Energy's National Renewable Energy Lab, Alaska possesses 99% of the best wind energy sites in the entire United States.


Overshoot -- Carbon Accumulation & the Myth of Carbon-Neutral Wood Heat

Despite these world-class, highly promising renewable energy sources, TFR's membership and direction has been dominated by a self-serving and singular focus on woody biomass. TFR discussions have disregarded how biomass removal and combustion adds to carbon emissions. If reducing carbon emissions is truly the intent of TFR, why has there been no acknowledgement of the massive carbon emissions resulting from clearcutting, road building and silvicultural treatments?

Scientists estimate that worldwide deforestation accounts for up to 25% of greenhouse gas emissions necessitating urgent reductions in timber harvest. In their scientific paper, "Target Atmospheric CO₂: Where should Humanity Aim?," Dr. James Hansen and others advised unequivocally:

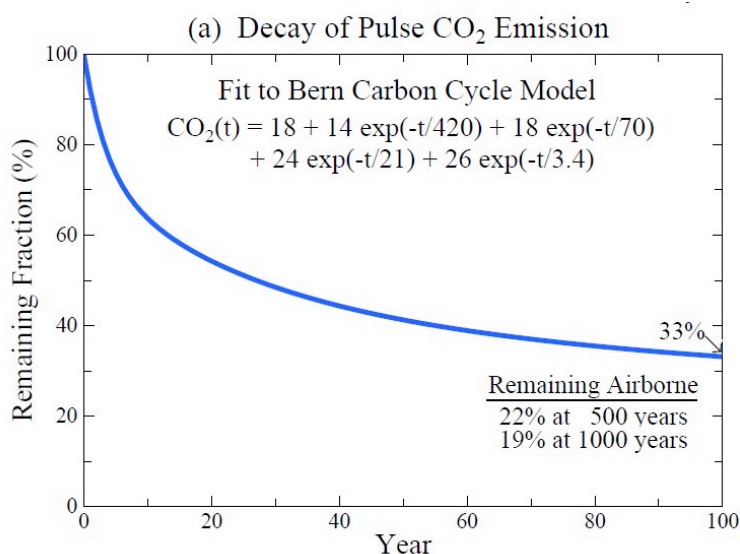
"If humanity wishes to preserve a planet similar to that on which civilization developed and to which life on Earth is adapted, paleoclimate evidence and ongoing climate change suggest that CO₂ will need to be reduced from its current 385 ppm to at most 350 ppm.

An initial 350 ppm CO₂ target may be achievable by phasing out coal use except where CO₂ is captured and adopting agricultural and forestry practices that sequester carbon. (emphasis added)



If the present overshoot of this target CO₂ is not brief, there is a possibility of seeding irreversible catastrophic effects." (Hansen et al. 2008)

Overshoot is driven by the long lifetime of CO₂ in the atmosphere, and its continuing accumulation even in a scenario of declining but non-zero global emissions. One third of a CO₂ emission pulse remains after a century, and one fifth remains well after a millennium as shown in the following chart (Hansen et al. 2007, see legend). This substantial portion of a pulse will persist in the atmosphere, "longer than Stonehenge. Longer than time capsules, longer than nuclear waste, far longer than the age of human civilization so far." (Archer 2009)



Left undisturbed, our old-growth and second-growth forests of southeast Alaska function as massive warehouses capable of capturing and storing incredible volumes of carbon. Using these same forests for heating and biofuel production is comparable to burning our warehouses down to stay warm. To do so in the presence of the world-class renewable energy resources of Southeast, which produce virtually zero carbon emissions, calls into question whether addressing catastrophic climate change is really the objective of TFR proponents of biomass/biofuel.

TFR discussions have often been based upon a myth repeated by timber industry advocates that burning wood, whether from old-growth or second-growth, is "carbon neutral" and that by clear-cutting old-growth forests, fast-growing young stands of trees function better as carbon sinks removing more CO₂ from the atmosphere than old-growth forests. *"That perspective was largely based on findings of a single study from the late 1960s which had become accepted theory, and scientists now say it needs to be changed"* ("Old Growth Forests Are Valuable Carbon Sinks" ScienceDaily Sep.14, 2008).



"Contrary to 40 years of conventional wisdom, a new analysis published in the journal Nature suggests that old growth forests are usually "carbon sinks" - they continue to absorb carbon dioxide from the atmosphere and mitigate climate change for centuries."(ibid.)

"Old-growth forests accumulate carbon for centuries and contain large quantities of it. We expect, however, that much of this carbon, even soil carbon, will move back to the atmosphere if these forests are disturbed".
(Luyssaert, et al. 2008)

This reinforces findings of a similar study made several years earlier with applicability for Southeast's forests. *"Soil carbon is a major component of the terrestrial carbon cycle. **The soils of the world contain more carbon than the combined total amounts occurring in vegetation and the atmosphere.** Consequently, soils are a major reservoir of carbon and an important sink. Because of the relatively long period of time that carbon spends within the soil and is thereby withheld from the atmosphere, it is often referred to as being sequestered ."*(Swift 2001)

Additionally, it must be recognized that forests across the continent have a wide range of capacities for carbon sequestration. Because the many centuries-old temperate rainforest of Southeast Alaska lacks the catastrophic fire events typical of other forests, the Tongass contains among the highest amounts of sequestered carbon of all the world's forests. The Tongass National Forest, alone, represents 8% of the total carbon in all the forests of the conterminous United States (Leighty, Hamburg, Caouette 2006).

This raises the stakes on our already evident climate change impacts including ocean acidification. While the dominant method of timber harvest in Southeast has been even-aged management employing clear cut methods, and while TFR members advocate its continued practice, there is little doubt such practices spell trouble for the region and the planet.

"Timber harvest, clear cutting in particular, removes more carbon from the forest than any other disturbance (including fire). The result is that harvesting forests generally reduces carbon stores and results in a net release of carbon to the atmosphere." Harmon (2007). "The majority of forest carbon released comes from what is left behind in the forest to decompose naturally, burned on site, or transported as waste from a mill where it is burned for fuel. Each of these outcomes of logging results in the release of carbon into the atmosphere".

In one study it was found that oldgrowth forests store up to four times more carbon than young or middle-aged forests (Law et al. 2003; Pregitzer and Euskirchen 2004; Fredeen et al. 2005; Smith et al. 2004).

Other studies show that logging can remove ninety-five percent of the non-soil carbon stored in a forest ecosystem with half of it being lost to the atmosphere in the first year (Janisch and Harmon 2002).



In yet another study tracking forest carbon after timber harvests which occurred between 1910 to 2000, Skog and Nicholson (2000) found that *71% of the carbon was released into the atmosphere*, 17% was stored in wood products and 12% ended up in landfills.

It is true stands of young growth in the aftermath of clearcutting have a high rate of carbon uptake, (Mackey et al. 2008). However, it has also been shown the carbon uptake accrued over a given harvest rotation would not make up for the amount of carbon stored in the originally logged old-growth. In that same study (Janisch and Harmon 2002), it was found that managed stands on 80 year rotations stored only *half* the carbon of old growth forests. The point of this being, once those “warehouses” storing carbon are destroyed, it takes centuries to rebuild the lost carbon capture and storage capacities at a time when our planet desperately needs these services.

Overburdened

It has been twenty years since Dr. James Hansen first warned our leaders of the climate change effects we are currently realizing. NASA scientists recently reported over 2 trillion tons of Greenland and polar ice have melted since 2003 alone. We have overburdened our skies with carbon dioxide which has overburdened our oceans with carbon dioxide, which is inexorably, acidifying that which covers 75% of our planet.

In consideration of the unequivocal urgency with which our top climate scientists frame our current predicament, TFR members would do well to realize the "futures" to which they are confining our region and our planet. Of all the renewable energy projects available in Southeast Alaska, woody biomass as a waste stream of further clearcutting clearly poses the greatest risks of accelerating climate change, further degrading fish and wildlife habitat, and further perpetuating the fiscal folly of propping up an industry which has not been able to exist without massive taxpayer subsidies. To date, over a billion dollars of taxpayer funds have been invested in a timber industry in Southeast Alaska that presently represents only .02% of the regional economy.

If anything, TFR discussions, process and methods to date expose the makeup of TFR membership as dominantly composed of stakeholders eager for fresh subsidies for a timber industry in Southeast. The emerging policy products of TFR such as a rush to endorse biomass energy systems without considering a full understanding of the science, reveals stakeholder circumsppection to be in short supply. Such circumsppection must necessarily include the recommendations of the Intergovernmental Panel on Climate Change (IPCC) which promotes conservation of existing carbon reserves as the most effective mitigation strategy for the land use and forestry sector:

“Reduced deforestation and degradation is the forest mitigation option with the largest and most immediate carbon stock impact in the short term per (hectare) and per year globally....”

(from: *Climate Change 2007: Mitigation of Climate Change. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 541-584).



Epilogue

The massive national subsidy stream being directed towards the utilization of agricultural feedstock and woody biomass for the production of biofuels may work elsewhere but it is a huge mistake of great consequence to regard southeast Alaska as the place to implement such programs. Our rainforest stores the highest amounts of carbon reserves in all the worlds forests. Despite stated intentions to reduce carbon emissions, a biomass/biofuel industry in Southeast will simultaneously release massive amounts of this stored carbon and deplete the ability of the largest remaining temperate rainforest on the planet to absorb carbon dioxide from the atmosphere.

The history of previous subsidies on the Tongass demonstrates not all subsidies result in the wisest investments of taxpayer dollars, nor lead to the sort of economic or ecological outcomes originally promised by our leaders. Now that it has become clear the economy of Southeast can function effectively without relying upon large scale industrial extraction of what remains of our oldgrowth temperate rainforest, we have an opportunity to improve upon outdated “business as usual” mindsets. Now more than ever, our survival will be linked to abandoning the mindsets of the past which have unwittingly precipitated our present crisis.

This is especially the case with looming catastrophic climate change and the parallel catastrophe of ocean acidification, which is already wreaking havoc in the oceans of the world. The “Second International Symposium on the Ocean in a High-CO₂ World” was held in Monaco - Oct. 2008. A declaration, based on irrefutable scientific findings and signed by 155 scientists from 26 nations, set forth recommendations, calling for policy makers to address this immense problem. Two considerations of the declaration loom large:

- **Ocean acidification is underway, accelerating, and severe damages are imminent:** *namely from fossil-fuel combustion, deforestation, and cement production. As this CO₂ dissolves in seawater, it forms carbonic acid, increasing ocean acidity.*
- **Ocean acidification will have socioeconomic impacts:** *Ocean acidification could affect marine food webs and lead to substantial changes in commercial fish stocks, threatening protein supply and food security for millions of people as well as the multi-billion dollar fishing industry.*

The TFR process is clearly, structurally hobbled by limiting its voting membership on the basis of a “stakeholder” status, and operating on a predicable agenda based upon “collaboration” and “partnership” models used elsewhere. The TFR has a moral obligation to see that its policy products are fully vetted by objective scientific research employing a full accounting of carbon losses to the atmosphere.

“When people who are honestly mistaken learn the truth, they will either cease being mistaken, or cease being honest.”—Anonymous

Literature cited:

- Archer, David. 2009.** The long thaw: how humans are changing the next 100,000 years of Earth's climate. Princeton Univ. Press.
- Butts, S.R. and W.C. McComb. 2000.** Associations of Forest Floor Vertebrates with Coarse Woody Debris in Managed Forests of Western Oregon. *J. Wildl. Manage.* 64(1):95-104.
- Caldwell, R.S. 1996.** Macroinvertebrates and their relationship to coarse woody debris: with special reference to land snails. Pages 49-54 in: J.W. McMinn and D.A. Crossley, Jr. (Editors): *Biodiversity and coarse woody debris in southern forests: effects on biodiversity*, Gen. Tech. Rep. SE-94. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 146. p.
- Carey, A.B., and M.L. Johnson. 1995.** Small mammals in managed, naturally young, and old-growth forests. *Ecological Applications* 5(2):336-352.
- Freedman, B., W. Zelazny, D. Beaudette, T. Fleming, S. Flemming, G. Forbes, J.S. Gerrow, G. Johnson, and S. Woodley. 1996.** Biodiversity implications of changes in quantity of dead organic matter in managed forests. *Environ. Rev.* 4:238-265.
- Hamburg, S.P. 2000.** Simple Rules For Measuring Changes In Ecosystem Carbon In Forestry-Offset Projects. *Mitigation and Adaptation Strategies for Global Change* 5:25-37
- Hansen et al. (2008),** Target Atmospheric CO₂: Where Should Humanity Aim?" *The Open Atmospheric Science Journal*, 2008, Volume 2 . Free download: <http://www.bentham.org/open/toascj/openaccess2.htm>
- Harmon, Mark. 2007.** Letter to California Air Resources Board. Comment on Forest Protocols. Online at: http://www.arb.ca.gov/lispub/comm/bccomdisp.php?listname=forestghg07&comment_num=22&virt_num=22.
- Harmon, Mark E and B. Marks. 2002.** Effects of silvicultural treatments on carbon stores in forest stands. *Canadian Journal of Forest Research* 32: 863-877.
- Harmon, Mark E., Ken Bible, Michael G. Ryan, David C. Shaw, H. Chen, Jeffrey Klopatek, and Xia Li. 2004.** Production, Respiration, and Overall Carbon Balance in an Old-growth Pseudotsuga-Tsuga Forest Ecosystem. *Ecosystems* 7:498-512.
- Harmon, Mark E., Janice M. Harmon, William K. Ferrell, and David Brooks. 1996.** Modeling carbon stores in Oregon and Washington forest products: 1900-1992. *Climatic Change* 33 (4):521-550.
- Harmon, Mark E., William K. Ferrell, and Jerry F. Franklin. 1990.** Effects on Carbon Storage of Conversion of Old-Growth Forests to Young Forests. *Science* 247:699-702.
- Hanula, J.L. 1996.** Relationship of wood-feeding insects and coarse woody debris. Pages 55-81 in : J.W. McMinn and D.A. Crossley, Jr. (Editors): *Biodiversity and coarse woody debris in southern forests: effects on biodiversity*, Gen. Tech. Rep. SE-94. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 146. p.
- Harmon, M.E., J.F. Franklin, F.J. Swanson, P. Sollins, S.V. Gregory, J.D. Latting, N.H. Anderson, S.P. Kline, N.G. Aumen, J.R. Sedell, G.W. Lienkaemper, K. Cromack Jr., and K.W. Cummins. 1986.** Ecology of coarse woody debris in temperate ecosystems. *Adv. Ecol. Res.* 15:133-302
- Janisch, J. E., and M. E. Harmon. 2002.** Successional changes in live and dead wood carbon stores: implications for net ecosystem productivity. *Tree Physiology* 22 (2-3):77-89.
- Kimmins, J.P. 1977.** Evaluation of the consequences for future tree productivity of the loss of nutrients in whole-tree harvesting. *For. Ecol. Mgmt.* 1:169-183.
- Law, B. E., O. J. Sun, J. Campbell, S. Van Tuyl, and P. E. Thornton. 2003.** Changes in carbon storage and fluxes in a chronosequence of ponderosa pine. *Global Change Biology* 9:510- 524.
- Luyssaert, S., E. -Detlef Schulze, Annett Bonner, Alexander Knohl, Dominik Hessenmoller, Beverly E. Law, Philippe Ciais and John Grace. 2008.** Old-growth forests as global carbon sinks. *Nature* 455: 213-215.
- Mackey, Brendan G, Heather Keith, Sandra L. Berry and David B. Lindenmayer. 2008.** Green carbon: the role of natural forests in carbon storage. Part 1, A green carbon account of Australia's south-eastern Eucalyptus forest, and policy implications. The Fenner School of Environment & Society, The Australian National University. 48 pp.
- Mackey, Brendan G, David B. Lindenmayer, Malcolm Gill, Michael McCarthy and Janette Lindesay. 2002.** Wildfire, Fire and Future Climate. CSIRO Publishing, Australia. 196pp.

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- Mälikönen, E. 1976.** Effect of whole-tree harvesting on soil fertility. *Silva Fennica*, 10:157-164.
- Maser, C. and J.M. Trappe. 1984.** The seen and unseen world of the fallen tree. USDA For. Serv. Gen.Tech. Rep. PHW-164. Pacific NW For. and Range Exp. Sta., Portland, OR. pp. 56.
- McCay, T.S. and M.J. Komoroski. 2004.** Demographic responses of shrews to the removal of coarse woody debris in a managed pine forest. *For. Ecol. Mgmt.* 189:1-3:387-395.
- Miller, D.H. and L.L. Getz. 1977.** Factors influencing local distribution and species diversity of forest small mammals in New England. *Can. J. Zool.* 55:806-814.
- Nabuurs, G.J. and R. Sikkema. 2001.** International Trade in Wood Products: Its role in the land use change and forestry carbon cycle. *Climatic Change* 49: 377-395.
- Nabuurs, Gert Jan, O. Masera, K. Andrasko, P. Benitez-Ponce, R. Boer, M. Dutschke, E. Elsiddig, J. Ford-Robertson, P. Frumhoff, T. Karjalainen, O. Krankina, W.A. Kurz, M. Matsumoto, W. Oyhantcabal, N.H. Ravindranath, M.J. Sanz Sanchez, and X. Zhang. 2007. IPCC Fourth Assessment Report, Working Group III, Chapter 9 (final draft). In *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by B. Metz, O. R. Davidson, P. R. Bosch, R. Dave and L. A. Meyer. Cambridge, United Kingdom and New York, NY, USA.: Cambridge University Press.**
- NREL. 2006.** From Biomass to Biofuels: NREL Leads the Way. National Renewable Energy Laboratory, Publication NREL/BF-510-39436. Golden, CO. 6 pp.
- Olsson, B.A. and H. Staaf. (1995)** Influence of harvesting intensity of logging residues on ground vegetation in coniferous forests. *Journal of Applied Ecology*, 32, 640-654.
- Olsson, B.A., J. Bengtsson, and H. Lundkvist. 1996.** Effects of different harvest intensities on the pools of exchangeable cations in coniferous forest soils. *For. Ecol. Mgmt.* 84(1996):135-147., g
- Perlack, R.D., L.L. Wright, A.F. Turhollow, R.L. Graham. B.J. Stokes, and D.C. Erbach. 2005.** Biomass as Feedstock for a Bioenergy and Bioproducts Industry: the Technical Feasibility of a Billion-Ton Annual Supply. U.S. Department of Energy Oak Ridge National Laboratory, Report Number ORLS/TM- 2005/66. Oak Ridge, TN. 60 p.
- Pregitzer, Kurt S. and Eugénie S. Euskirchen. 2004.** Carbon cycling and storage in world forests: biome patterns related to forest age. *Global Change Biology* 10:2052-2077. Science Daily, <http://www.sciencedaily.com/releases/2008/09/080910133934.htm>
- Skog, K.E and G. Nicholson. 2000.** Carbon Sequestration in Wood and Paper Products. Gen.Tech. Rep. RMRS-GTR-59. U.S. Department of Agriculture, Forest Service, 10 p.
- Staaf, H. and B.A. Olsson. 1991.** Acidity in four coniferous forest soils after different harvesting regimes of logging residues. *Scand. J. For. Res.* 6:19-29. United States Department of Agriculture (USDA). 2007. Interim update of the 2000 Renewable Resources Planning Act Assessment. U.S. Dept. Agric. For. Serv. Rep. FS-874, 116 p.
- Weetman, G.F. and G. Webber. 1972.** The influence of wood harvesting on the nutrient status of two spruce stands. *Can. J. For. Res.* 2:351-369.
- Wells, C.G. and J.R. Jorgensen. 1979.** Effect of intensive harvesting on nutrient supply and sustained productivity. In: A.L. Leaf (Editor): *Impact of Intensive Harvesting on Forest Nutrient Cycling*, Proc. Symp State Univ of New York Syracuse NY pp212-230